



FDR-9647-LC, FDT-9648-LC, and FDB-9649-LC

**3G/HD/SD Dual Channel Fiber Receivers,
Transceivers, Transmitters User Manual**



Video Production Technology

FDR-9647-LC, FDT-9648-LC, and FDB-9649-LC User Manual

- Ross Part Number: **9647DR-004-03**
- Release Date: June 20, 2013.

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Important Regulatory and Safety Notices to Service Personnel

Before using this product and any associated equipment, refer to the “**Important Safety Instructions**” listed below to avoid personnel injury and to prevent product damage.

Product may require specific equipment, and/or installation procedures to be carried out to satisfy certain regulatory compliance requirements. Notices have been included in this publication to call attention to these specific requirements.

Symbol Meanings



Protective Earth — This symbol identifies a Protective Earth (PE) terminal, which is provided for connection of the supply system's protective earth (green or green/yellow) conductor.



This symbol on the equipment refers you to important operating and maintenance (servicing) instructions within the Product Manual Documentation. Failure to heed this information may present a major risk of damage or injury to persons or equipment.



Warning — The symbol with the word “**Warning**” within the equipment manual indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.



Caution — The symbol with the word “**Caution**” within the equipment manual indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury. It may also be used to alert against unsafe practices.



Warning Hazardous Voltages — This symbol is intended to alert the user to the presence of uninsulated “dangerous voltage” within the product enclosure that may be of sufficient magnitude to constitute a risk of shock to persons.



ESD Susceptibility — This symbol is used to alert the user that an electrical or electronic device or assembly is susceptible to damage from an ESD event.

Important Safety Instructions



1. **Warning** – Read these instructions.
2. Follow all instructions.
3. Refer all servicing to qualified personnel.
4. The safe operation of this product requires that a protective earth connection be provided. A grounding conductor in the equipment's supply cord provides this protective earth. To reduce the risk of electrical shock to the operator and service personnel, this ground conductor must be connected to an earthed ground.
5. The AC appliance inlet on the product's power supply is the means to disconnect the supply from the AC Mains. It must remain readily operable for this purpose.



6. **Warning – Indoor Use: WARNING:** To reduce the risk of fire or electric shock, do not expose this apparatus to rain or moisture.

Important Laser Safety Measures and Notices

Before using this product and any associated equipment, refer to the sections below so as to avoid personnel injury and to prevent product damage. For further safety information when using fiber products, consult the following publications:

- *IEC-60825-2, Safety of Laser Products - Part 2: Safety of Optical Fiber Communication Systems (OFCS)* (for use outside of the U.S.A.)
- *ANSI Z136.2, Safe Use of Optical Fiber Communication Systems Utilizing Laser Diode and LED Sources* (for use in the U.S.A.)

Products may require specific equipment, and/or installation procedures be carried out to satisfy certain regulatory compliance requirements.



Caution — Before operating or servicing this product, all personnel should be familiar with laser safety and fiber handling practices.

Safety Measures for Operation

During normal operation of this product, heed the following safety measures:

- Do not stare at, or into, broken or damaged, fibers.
- Do not stare at, or into, optical connectors.
- Only properly trained and authorized personnel shall be permitted to perform laser/fiber optic operations.
- Ensure that appropriate labels are displayed in plain view and in close proximity to the optical port on the protective housing/access panel of the terminal equipment.

Safety Measures for Maintenance and Servicing



Warning — *Do not use optical equipment, such as a microscope or an eye loupe, to stare at the energized fiber end. Doing so may damage your eyes.*

During maintenance and servicing of this product, only properly trained and authorized personnel shall be allowed to use optical test or diagnostic equipment.

Laser Information



CLASS 1 LASER PRODUCT
IEC 60825-1:2007

Caution — **INVISIBLE LASER RADIATION WHEN OPEN. AVOID EXPOSURE TO THE BEAM.**

EMC Notices

United States of America FCC Part 15

This equipment has been tested and found to comply with the limits for a class A Digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.



Notice — *Changes or modifications to this equipment not expressly approved by Ross Video Limited could void the user's authority to operate this equipment.*

CANADA

This Class “A” digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de la classe “A” est conforme à la norme NMB-003 du Canada.

EUROPE

This equipment is in compliance with the essential requirements and other relevant provisions of **CE Directive 93/68/EEC**.

INTERNATIONAL

This equipment has been tested to **CISPR 22:2009** and found to comply with the limits for a Class A Digital device.

AUSTRALIA

This equipment has been tested to **AS/NZS CISPR 22:2009**, and found to comply with the limits for a Class A Digital device.

Maintenance/User Serviceable Parts

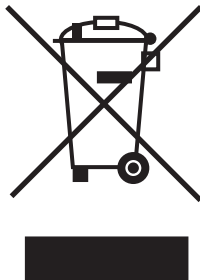
Routine maintenance to this GearLite product is not required. This product contains no user serviceable parts. If the module does not appear to be working properly, please contact Technical Support using the numbers listed under the “Contact Us” section on the last page of this manual. All GearLite products are covered by a generous 3-year warranty and will be repaired without charge for materials or labor within this period. See the “Warranty and Repair Policy” section in this manual for details.

Environmental Information

The equipment that you purchased required the extraction and use of natural resources for its production. It may contain hazardous substances that could impact health and the environment.

To avoid the potential release of those substances into the environment and to diminish the need for the extraction of natural resources, Ross Video encourages you to use the appropriate take-back systems. These systems will reuse or recycle most of the materials from your end-of-life equipment in an environmentally friendly and health conscious manner.

The crossed-out wheeled bin symbol invites you to use these systems.



If you need more information on the collection, reuse, and recycling systems, please contact your local or regional waste administration.

You can also contact Ross Video for more information on the environmental performances of our products.

Introduction

The GearLite Dual Channel Fiber Receivers/Transmitters are high-quality signal conversion solutions within the family of GearLite compact, self-contained modular products.

A universal power adaptor and line cord, suitable for the country of use, is supplied with each module. Various mounting options are included that enable a wide range of installation choices.

FDR-9647-LC Overview

The FDR-9647-LC is a fiber optic receiver to SDI converter capable of equalizing all common serial digital signals. Each channel of the module equalizes the incoming SDI signal. Each channel of the module provides one output each.

The FDR-9647-LC provides the ability to transport digital video baseband signals over a fiber optic link, allowing for longer transport distances. SDI outputs are re-clocked providing excellent jitter and return loss specifications.

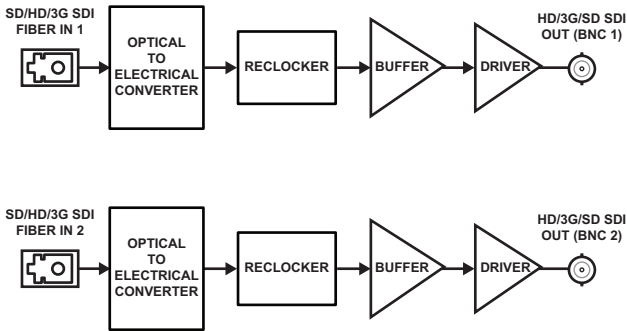


Figure 1 Simplified Block Diagram of FDR-9647-LC Functions

FDT-9648-LC Overview

The FDT-9648-LC is a SDI to fiber optic converter capable of equalizing and re-clocking all common serial digital signals. Each channel of the module equalizes the incoming SDI signal, re-clocks the signal with automatic rate detection for all popular data rates. Each channel is fully independent and can run at different data rates.

The FDT-9648-LC provides the ability to transport digital video baseband signals over a fiber optic link, allowing for longer transport distances. SDI outputs are re-clocked providing excellent jitter and return loss specifications.

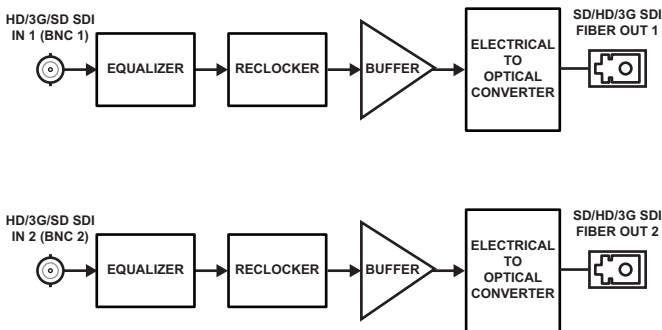


Figure 2 Simplified Block Diagram of FDT-9648-LC Functions

FDB-9649-LC Overview

The FDB-9649-LC provides one fiber optic receiver to SDI converter capable of equalizing all common serial digital signals and one SDI to fiber optic converter capable of equalizing and re-clocking all common serial digital signals.

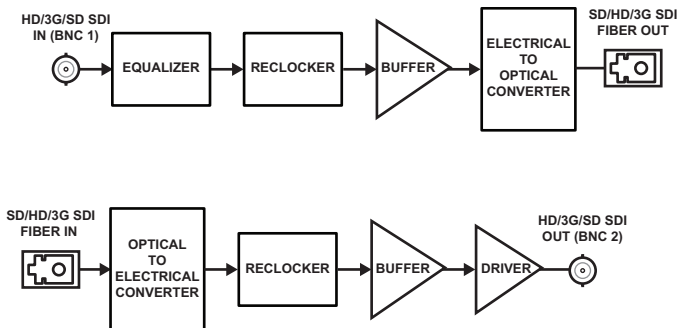


Figure 3 Simplified Block Diagram of FDB-9649-LC Functions

Features

Each module includes the following standard features:

- Supports major SDI formats up to 1080p 60Hz
- Supports single-mode fiber
- Re-clocking on all outputs at 270Mbps, 1.483Gbps, 1.485Gbps, 2.967Gbps, and 2.970Gbps
- Input status indicator LEDs
- Small brick form factor
- 5V universal adapter with locking DC connector
- 3-year warranty

FDR-9647-LC

In addition to the standard features, the FDR-9647-LC also includes:

- Two BNC jacks for SDI outputs
- Two LC/UPC PIN connectors for fiber optic inputs

FDT-9648-LC

In addition to the standard features, the FDT-9648-LC also includes:

- Two BNC jacks for SDI inputs
- Two LC/UPC PIN connectors for fiber optic outputs

FDB-9649-LC

In addition to the standard features, the FDB-9649-LC also includes:

- One BNC jack for an SDI input
- One BNC jack for an SDI output
- One LC/UPC PIN connector for fiber optic input
- One LC/UPC PIN connector for fiber optic output

Installation

Static Discharge

Whenever handling the modules and other related equipment, please observe all static discharge precautions as described in the following note:



ESD Susceptibility — *Static discharge can cause serious damage to sensitive semiconductor devices. Avoid handling circuit boards in high static environments, such as carpeted areas, and when wearing synthetic fiber clothing. Always exercise proper grounding precautions when working on circuit boards and related equipment.*

Unpacking

Unpack each module you received from the shipping container and ensure that all items are included. If any items are missing or damaged, contact your sales representative or Ross Video directly.

Working with Fiber Optic Connectors

Keep the following in mind when working with fiber optic connectors:

- Every time you are required to insert a connector into a device or mating sleeve, you must clean the connector. All exposed surfaces of the ceramic ferrule must be clean. Follow your facility practices of cleaning fiber optic connectors.
- Connectors must always be inserted into a device or have a dust cap on.
- A poor optical connection is often similar to a poor electrical connection. Try removing the connector, cleaning, and re-inserting the connector. A bad connection can result in experiencing instability of signal, high loss, or a noisy signal.

Mounting and Installation

The module can be mounted in any convenient location. However, to ensure long life for this product, observe the following precautions and operating requirements:

- Maintain an ambient temperature of 0°C to 40°C (32°F to 104°F).
- Allow for air circulation around the chassis for convectional cooling.

Many different mounting positions are possible. Some installation options are permanent and require careful consideration of the final positioning before installation. Please note that in some mounting locations, the power adaptor must be affixed in a similar manner as the chassis.

Other possible options include the use of adhesive magnetic sheets (not included) affixed to the chassis and the power adaptor, for removable mounting on metal cabinets etc.

Cable ties may be necessary in some applications to relieve strain on the mounting hardware and the connectors.

Surface Mount Strips

The included VELCRO® brand surface mount strips allow the GearLite module and power supply to be affixed to a permanent location during use and easily removed for adjustments. Carefully consider the installation location before proceeding; the adhesive is very aggressive and is not easily removed. The adhesive will cure fully in 24 hours.

To install the Surface Mount Strips

1. Remove the **Protective Backing Film** from the adhesive on the bottom of the two VELCRO® brand **Surface Mount Strips**.
2. Adhere the **Surface Mount Strips** to the bottom side of the chassis. (**Figure 4**)

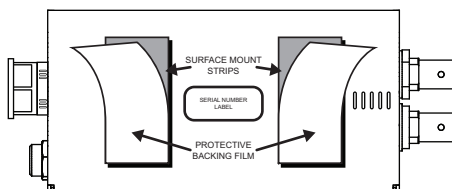


Figure 4 Surface Mount Installation Option

3. Remove the **Protective Backing Film** from the other side of the VELCRO® brand **Surface Mount Strips**.
4. Press the chassis into position on the surface you want to mount it to.



Operating Tip — An additional VELCRO® brand **Surface Mount Strip** is available to mount the power adapter.

Non-Slip Pads

Four non-slip adhesive pads have been supplied for desktop placements. Simply remove the protective backing film from the adhesive and affix one non-slip pad to each of the four corners on the bottom of the chassis.

Setup and Operation

Power Adapter and Supply

Connect the PS-9000 power adaptor to the power supply connector. The PS-9000 provides regulated +5V DC (5%) @ up to 2A. The DC power cord has a locking connector that securely fastens into the power supply DC jack on the GearLite chassis. The chassis has a standard miniature power jack (center pin positive). Refer to the section “**Important Regulatory and Safety Notices to Service Personnel**” on page 2 for details.

If using an adaptor other than the PS-9000, ensure that:

- the polarity is correct
- the voltage is +5V DC regulated to 5%
- sufficient current for the GearLite module is supplied



Caution — Use of improper adaptors may damage your GearLite module and will void the warranty.

Cable Connections Overview



Caution — Never attempt to look down the barrel of a connected fiber or device transmitting an optical signal. The transmitted light is not in the visible spectrum and may cause permanent eye damage. Turn off all laser sources before disconnecting devices.

BNC Connections

There are five connections on each module:

- Two BNC jacks for the SDI signals
- Two single-mode, LC/UPC PIN connectors for the fiber optic signals
- A power supply connection to the GearLite PS-9000 power adaptor

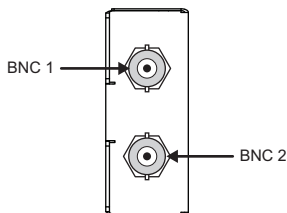


Figure 5 BNC Connections

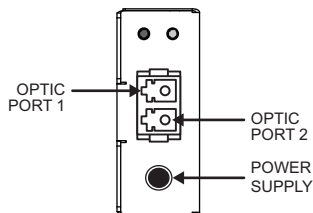


Figure 6 Fiber and Power Connections

Connect the BNC cables to the module according to the designations indicated on the chassis label, **Figure 5**, and **Table 1**. If the input source is successfully detected, the corresponding LOCK SDI LED will light solid green. It is not necessary to terminate unused outputs.

Table 1 BNC Cabling Designations

Product	BNC	Connection
FDR-9647-LC	1	SDI OUT 1
	2	SDI OUT 2
FDT-9648-LC	1	SDI IN 1
	2	SDI IN 2
FDB-9649-LC	1	SDI IN
	2	SDI OUT

Fiber Connections

Before connecting your fiber optic signals:

- Refer to the section “**Important Laser Safety Measures and Notices**” on page 3 for safety information before handling fiber optic devices.
- Remove the dust cap from the fiber port connectors on the module before connecting your fiber optic signals.
- Ensure that the exposed surface of the ceramic ferrule of each connector is clean. Refer to the section “**Working with Fiber Optic Connectors**” on page 10 for cleaning tips.

Connect the fiber optic cables to the module according to the designations indicated on the chassis label, **Figure 6**, and **Table 2**. If the input source is successfully detected, the corresponding LOCK OPTO LED will light solid green.

Table 2 Fiber Cabling Designations

Product	Fiber Port	Connection
FDR-9647-LC	1	FIBER OPTIC IN 1
	2	FIBER OPTIC IN 2
FDT-9648-LC	1	FIBER OPTIC OUT 1
	2	FIBER OPTIC OUT 2
FDB-9649-LC	1	FIBER OPTIC IN
	2	FIBER OPTIC OUT

Status LEDs

Each module includes two LEDs that display the status of the input signal activity. These LEDs are located above the fiber optic connectors (**Figure 7**). **Table 3** describes the functions the LEDs for each module type.

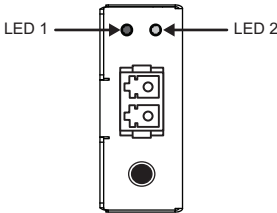


Figure 7 Right-edge Status Indicator LEDs

Table 3 LED Descriptions

Product	LED	Reports Status of	LED Color	Function
FDR-9647-LC	1	FIBER OPTIC IN 1	Green	LED is lit green when there is a valid video signal on the IN 1 fiber connector
			Red	LED is lit red when there is an invalid fiber optic signal
	2	FIBER OPTIC IN 2	Green	LED is lit green when there is a valid video signal on the IN 2 fiber connector
			Red	LED is lit red when there is an invalid fiber optic signal
FDT-9648-LC	1	SDI IN 1	Green	LED is lit green when there is a valid SDI signal on the IN 1 BNC
			Red	LED is lit red when there is an invalid SDI signal
	2	SDI IN 2	Green	LED is lit green when there is a valid SDI signal on the IN 2 BNC
			Red	LED is lit red when there is an invalid SDI signal

Table 3 LED Descriptions

Product	LED	Reports Status of	LED Color	Function
FDB-9649-LC	1	FIBER OPTIC IN	Green	LED is lit green when there is a valid video signal on the IN fiber connector
			Red	LED is lit red when there is an invalid fiber optic signal
	2	SDI IN	Green	LED is lit green when there is a valid SDI signal on the SDI IN BNC
			Red	LED is lit red when there is an invalid SDI signal

Specifications

Table 4 provides the technical specifications for all modules unless otherwise noted. Specifications are subject to change without notification.

Table 4 Technical Specifications

Category	Parameter	Specification
SDI Inputs/ Outputs	Standards Accommodated	SMPTE 259M, SMPTE 292M, SMPTE 424M
	Input Voltage	800mV, nominal
	SDI Data Rate	270Mbps, 1.5Mbps, and 3Gbps
	Impedance	75ohm
	Input Cable Equalization	SD: 100m HD: 100m 3G: 80m
	Return Loss	-12dB (all formats)
Fiber Inputs/ Outputs	Standards Accommodated	SMPTE 259M, SMPTE 292M, SMPTE 424M
	Operating Wavelength Range	1310nm
	Input Power Operating Range (Color Bars)	-3dBm to -18dBm @ 2.97Gbps -3dBm to -19dBm @ 270Mbps and 1.5Gbps
	Input Power Operating Range (Pathological)	-3dBm to -17dBm @ 2.97Gbps -3dBm to -18dBm @ 270Mbps and 1.5Gbps
	Receiver Overload	At values above -3dBm
	Output Center Wavelength	+/- 20nm
	Output Power	-7dBm to -2dBm
	Output Laser Type	Fabry-Perot (FP)
	Connector Types	Single Mode, LC/UPC PIN
Power	Required Voltage	+5v DC
	Maximum Power	5W
Environment	Thermal Environment	0°C to 40°C (32°F to 104°F) ambient, non-condensing

Table 4 Technical Specifications

Category	Parameter	Specification
Other	Dimensions	13cm x 4cm x 2cm (5.25" x 1.75" x 0.75")
	Weight	170g (6oz)

Service Information

Warranty and Repair Policy

The GearLite Product is warranted to be free of any defect with respect to performance, quality, reliability, and workmanship for a period of THREE (3) years from the date of delivery to the customer. In the event that your GearLite module proves to be defective in any way during this warranty period, Ross Video Limited reserves the right to repair or replace this piece of equipment with a unit of equal or superior performance characteristics.

Should you find that this GearLite Product has failed after your warranty period has expired, we will repair your defective product should suitable replacement components be available. You, the owner, will bear any labor and/or part costs incurred in the repair or refurbishment of said equipment beyond the THREE (3) year warranty period.

In no event shall Ross Video Limited be liable for direct, indirect, special, incidental, or consequential damages (including loss of profits) incurred by the use of this product. Implied warranties are expressly limited to the duration of this warranty.

This GearLite User Manual of our Digital Products line provides all pertinent information for the safe installation and operation of your GearLite Product. Ross Video policy dictates that all repairs to the GearLite module are to be conducted only by an authorized Ross Video Limited factory representative. Therefore, any unauthorized attempt to repair this product, by anyone other than an authorized Ross Video Limited factory representative, will automatically void the warranty. Please contact Ross Video Technical Support for more information.

In Case of Problems

Should any problem arise with your GearLite Product, please contact the Ross Video Technical Support Department. (Contact information is supplied at the end of this publication.)

A Return Material Authorization number (RMA) will be issued to you, as well as specific shipping instructions, should you wish our factory to repair your GearLite Product. If required, a temporary replacement module will be made available at a nominal charge. Any shipping costs incurred will be the responsibility of you, the customer. All products shipped to you from Ross Video Limited will be shipped collect.

The Ross Video Technical Support Department will continue to provide advice on any product manufactured by Ross Video Limited, beyond the warranty period without charge, for the life of the equipment.



Contact Us

Contact our friendly and professional support representatives for the following:

- Name and address of your local dealer
- Product information and pricing
- Technical support
- Upcoming trade show information

Technical Support

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